

AN ARCHEOLOGY OF MEANING

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A potentially creative tension, a critical commentator might call it a fault line, runs through the project of Horne and Lowe (1996): The matching-to-sample paradigm, a "highly artificial . . . odd experimental paradigm," as the authors themselves call it (p. 238), confronts an immense problem area of naturalistic meaning and reference. Such a discrepancy in breadth is not necessarily a disadvantage in the first stages of an analytical investigation, yet the chasm separating this study from most discussions of semantics will have to be bridged, because the authors themselves endeavor to "foster productive interaction with scientists from other traditions" (p. 186). For such bridging, the existence of scholars from other fields and the potential relevance of their work will have to be acknowledged. The "archeology" aspect indicated in the above title, referring to older contributions from a variety of fields, is intended to contribute to such interaction. Three aspects are emphasized: (a) a bridge to naturalistic semiotic performance in animals, (b) additional research on children's semiotic development, and (c) a bridge to philosophical and psycholinguistic approaches to meaning.

Stimulus Equivalences and Semiotic Performance in Animals

I was astonished to read in Horne and Lowe (1996) that stimulus equivalences could not be established in animals. It would have seemed to me that no higher animal (whether predator or prey) could survive without being a quick learner of stimulus equivalences (e.g., that the smell, sound, sight, tracks, excreta of a predator mean danger). Admittedly, these are *functional equivalences* (p. 190) only and do not conform to the operational definition of *stimulus equivalence*, in that they do not entail all three features of the math-

ematical concept of equivalence. Yet, when a prey animal learns the equivalence between predators and the sounds they produce as well as the equivalence of predators and their scents, it will sniff when hearing this sound and search visually for the predator's location (cf. Rubenstein & Wrangham, 1986, passim for discussions of "predator vigilance"), similar to a child engaging in listener behavior after being asked "Where is the teddy bear?" Such gazelle behavior appears to be similar to the emergent equivalences BC and CB in Figure 2 of Horne and Lowe. Following the authors' reasoning (p. 187), I would therefore suggest that the gazelle has formed a stimulus class that seems to involve symmetry and transitivity, even if this has not been observed in the laboratory.

The above pertains obviously only to *perceptual* functioning, and one of the main aspects of symbolic behavior is the production of a member of the equivalence class. Although animals can quite easily be trained to react appropriately to commands, their symbolic productivity is often doubted. This should be examined. There exists, of course, a broad literature on "language" learning of apes (Harnad, Steklis, & Lancaster, 1976; Miles, 1990; Savage-Rumbaugh, 1994). But even without training, *mand naming* appears to be common. A real-life example might serve as a starting point: When my kitty wanted to be let out, he jumped on the arm of the couch, hit the safety-chain that dangled within reach of his paw, and looked back at me. If I did not respond expeditiously, he repeated this sequence. He was never explicitly trained in this, yet quite complex relationships exist between multiple stimuli: access to the outdoors as a reinforcing consequence, the door as an obstacle, the chain that can be manipulated, and the person whose behavior is the means to produce the consequence. Originally, the jingling chain and the opened door preceded the getting out. Later, getting out was the previously experienced consequence and jin-

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gling was employed as a mand name; this performance suggests symmetry, because the cat had not previously produced the jingling. What is the behavioral difference between this performance and our ringing the doorbell when visiting?

Stories of dogs bringing the leash to the master when they want to go on a walk are commonplace. There are reports (Cheney & Seyfarth, 1980) that wild vervet monkeys produce different warning signals for different predators. This performance would be another precursor to naming. Prevarication, a unique language feature strongly emphasized by Hockett (1960), was found in some of Köhler's (1951) apes. These apes also took a person's hand and guided him or her to perform a specific desired activity. Specialists in animal ecology could probably report much more intentional communication. As a developmental psychologist, I am therefore skeptical whether such a sharp distinction should be drawn between animals and the name-giving homo sapiens in their capacity to establish various degrees of equivalence relations. Vauclair (1990) discusses such continuities from a Piagetian perspective.

Additional Research on Children's Semiotic Development

Proceeding from animals to the neonate and very young infant, stimulus equivalences are also early established: The mother's voice, sight, and even her body odor are responded to as interchangeable in many respects, even if this might again be only functional equivalence. Piaget (1952) has described in detail how even slight noises in the room induced the infant to anticipate the appearance of the mother. Piaget has derived later symbolic behavior from these early equivalences. Multiple symmetrical relationships between sights and sounds in relation to feeding and other important events have been documented in careful observations.

Proceeding to message production, it can be shown how the infant's instinctual crying changes within a few weeks after birth to "calling," as indicated by changes in the sound spectra. Piaget (1952) has reported that preverbal infants have also been observed to take the hand of a parent to guide him or her to a thing that needs to be handled. This comes very close to demanding an

action, and it is acquired without any explicit training. More generally, social signaling needs to be considered here. Pointing serves both as a discriminative stimulus and as an operant response for children with specific expressive language delay. It probably derives from instinctive reaching that precedes verbal reference (Bates, Bretherton, & Snyder, 1988) but later becomes an act of communication through social consequences. Words can then readily replace the pointing (Whitehurst & Fischel, 1994), showing that the equivalence principle has been operative prelinguistically.

Closer in specific semantic emphasis is Nelson's research program on the acquisition of meaning, culminating in her book, *Making Sense: The Acquisition of Shared Meaning* (1985). Moerk (1986), especially in the section on "The Environmental/Instructional Impact," has provided a more behavioral evaluation of her work. Clark, who spent her entire professional life studying the development of meaning, has summarized her conclusions in *The Lexicon in Acquisition* (1993). Her name, too, is missing from Horne and Lowe's reference list. During 1996, informative discussions on early vocabulary have proceeded on the CHILDES network, which could not be included in Horne and Lowe's article, but these could be an important source of information for the reconceptualization of the argument. The 1995 *Handbook of Child Language* also contains a relevant chapter by Barret on "Early Lexical Development."

From an evolutionary and developmental perspective, the question should be raised as to how Sidman's stimulus equivalence as a biologically given function (p. 189) relates to the multimodal perception that is centered in the superior colliculus in the brain (Pöppel, Held, & Dowling, 1977) and is most functional during early development. Considering what was indicated above about the survival value of multimodal exploration, such phylogenetically and ontogenetically early roots would be expected. Moerk (1984) has related this evidence to symbolic development. Because multimodal perception seems to imply considerable symmetry and perhaps even transitivity in the relationships between stimuli, stimulus equivalence could have relatively

primitive neurological roots. Werner (1940) has explored related topics as “synesthesia.”

In past developmental discussions, a trichotomy of *index*, *icon*, and *symbol* has been generally employed. The index could probably be equated with the discriminative stimulus; responses to iconic aspects are already found in fearful reactions of apes to unknown percepts, as reported by Langer (1942). Signs are verbal labels. Why did Horne and Lowe neglect this widely accepted developmental trichotomy?

Two generalizations can be drawn from the observations presented so far. First, mand naming (in a broad sense) is functional. In accordance with this principle, many early vocal-verbal communications, such as *up*, *down*, *want*, are employed as operants. And certainly animals induce their masters, sometimes through manipulating acquired symbols, to provide particular reinforcers. Second, a large repertoire of “names,” that is, of specific signals related to ends (particular consequences), provides the potential for effective messages in a variety of situations. The establishment of a large number of words could first be a generalized operant to control the social environment and could thereafter become a tool of cognitive mastery through the classification of experiences, as Langer (1942) argued and Horne and Lowe (1996) implied.

An Extension to Philosophical, Psycholinguistic, and Cognitive Approaches to “the Meaning of Meaning”

The title chosen for the present comment was adapted from the famous book of Foucault (1970), *The Order of Things: An Archeology of the Human Sciences*. The book’s original title was *Les mots et les choses* (*Words and Things*), and it surveys conceptions of meaning from the Renaissance to the present. My title suggests that pre-Skinnerian writings, such as *The Meaning of Meaning* (Ogden & Richards, 1923) might be worth digging up when dealing with this complex topic. A central omission is the work of Frege (1848–1925) and his pivotal distinction between reference and meaning (or sense), as succinctly summarized in Ogden and Richards (1923). A more extensive source for Frege’s conceptualizations is the translation provided by Geach and Black (1952). This distinction has been ac-

cepted in most discussions on semantics of the last hundred years (cf. Whitehead & Russell, 1910–1913). Frege, a mathematician, employed a mathematical perspective in his semantic analyses (Geach & Black, 1952). His concept of *identity* is close to the equivalence relation. A system of stimulus equivalences, such as that presented by Sidman and Tailby (1982), relying on the mathematical principle of equivalence, would therefore seem to have special affinity to Frege’s ideas. The argument against “sameness” made by Horne and Lowe (p. 234ff) has been discussed since the Renaissance under the notion of “resemblance” (Foucault, 1970, p. 67ff). What the authors refer to on page 189 as the relationships between speaker, listener, and object in Skinner’s (1957) theory was analyzed much more extensively, and profoundly, by Karl Bühler (1934/1965) in his “organon model” of language. A triadic model is common in recent history as it was in the writings of Peirce (1839–1914; as surveyed in Murphey, 1961), in those of Frege (1848–1925), in Ogden and Richards (1923), and in many subsequent discussions. It originated with the Stoics. Pre-Skinnerian work with special affinities to behaviorism might have been brought to bear, notably the extensive work by Charles Morris (e.g., 1946) on semantics and Mowrer’s (1960) theories of language origins. I am surprised that these are reflected neither in Horne and Lowe’s lead article nor in the commentaries.

Without such complex epistemological grounding, a serious category error might have been committed by Horne and Lowe (1996) when they reject the match-to-sample paradigm in favor of a naming explanation. With this shift, the explanandum, that is, the symbolic capacity for naming, has become the explanans under the subterfuge of “echoic behavior” and “listener behavior,” seemingly without the authors noticing it. However, if the symbolic capacity (naming) is based on simple principles, then many species should be trainable in language skills, or should have developed them spontaneously, because naming is so functional in shared endeavors. As this does not seem to be the case, the learnability of naming needs to be explained, not just presumed.

Whereas the above remarks are intended as constructive criticisms, they imply also an

acknowledgment of the courage of Horne and Lowe, who have tackled a topic which the best minds of Western civilization have struggled with at least since Plato's *Kratylos*. Other civilizations have done the same, as briefly discussed in Ogden and Richards (1923). Equally, the wisdom of the editors is to be applauded; they knew how many minds might be needed to contribute building blocks to an empirical and process-based theory of reference and meaning. My contributions are intended as a medley of potential constituents to the challenging endeavor of Horne and Lowe.

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